GEOLOGY AND SLOPE STABILITY OF THE "SNODGRASS MOUNTAIN SKI AREA", CRESTED BUTTE, COLORADO

Submitted to:
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EXECUTIVE SUMMARY

The SE flank of Snodgrass Mountain contains many of the proposed ski trails and lifts of the proposed Snodgrass Mountain Ski Area. Much of the area is underlain by prehistoric landslide deposits, which were mapped by previous workers and in this report. This study describes the location and characteristics of 57 individual landslides, and assesses their stability in the existing condition (pre-development). Using the limit-equilibrium stability program PCSTABL5M, we also predict the change in landslide stability due to the proposed action (see table below).

Minimum Factors of Safety (FS) from landslide stability analyses. FS values are considered to be minima because input parameters were chosen to be conservative.

CROSS-SECTION	LANDSLIDE POLYGON	Pre-development FACTOR OF SAFETY	Post-development FACTOR OF SAFETY
WEST	9	1.37	1.35
WEST	11	--	1.35
CENTRAL, N HALF	22	2.42	1.71
CENTRAL, N HALF	21	1.11	1.05
CENTRAL, QEFY	1	1.11	1.07
CENTRAL, S HALF	14	1.08	1.04
EAST	36	1.11	1.10

Landslides of the SE flank show considerable current stability (Factor of Safety, FS>1.3) where slope angles are low to moderate, regardless of the morphologic age of the slide (e.g., landslide polygons 9, 11, 22). Development actions do not decrease the FS below 1.3. In contrast, landslides on the steeper slope bands (more than 17° slopes), have minimum predicted FS of 1.08 to 1.11. Where development actions are concentrated, they are predicted to decrease the stability by about half (e.g. polygon 21, 1.11 to 1.05; polygon 1, 1.11 to 1.07; polygon 14, 1.08 to 1.04). In peripheral areas such as the East Slide (a no disturbance zone), the impacts are slight (1.11 to 1.10).

Even though slope failure is not predicted to result from the proposed action, the minimum, post-development FS is close enough to 1.0 on the steep slope bands that aggressive mitigation is recommended there. In our opinion, the most cost-effective mitigation would involve surface water management to decrease runoff and infiltration above the steep slope bands, and groundwater management to lower the pore pressures on the steep slope bands. Slug tests indicate that the hydraulic conductivity of “aquifers” in the landslides is low, on the order of $2x10^{-5}$ cm/sec. Therefore, the length, diameter, spacing, and gradient of the horizontal drains will have to be chosen carefully in the design phase to optimize yields.